

# Physical Performance Measures

## Masterclass Motorische stoornissen bij Dementie

Hans Drenth MPt

geriatrie fysiotherapeut / promovendus



**NPI** Kenniscentrum  
Paramedische Zorg

[www.paramedisch.org](http://www.paramedisch.org)



# Inhoud

- Inleiding
- Testen op fysieke domein;  
uithoudingsvermogen, kracht, balans,  
functionele mobiliteit
- Lopen : lopen en cognitie  
loopsnelheid  
dynamische looptest
- Vragen



# Inleiding

- “Geschikte” testen nodig om :
  - effect behandeling meten (groepen/individu)
  - functionele status
  - screening/diagnostiek
- Ouderen met cognitieve problemen



# Voorwaarden

- Eenvoudige instructie
- Makkelijk uitvoerbaar
- Makkelijk te scoren, noteren, interpreteren
- Kosten effectief
- Valide, betrouwbaar (reliability/agreement)



# Inleiding

Dement Geriatr Cogn Disord Extra 2012;2:589–609

Review Article

## Recommended Measures for the Assessment of Cognitive and Physical Performance in Older Patients with Dementia: A Systematic Review

Willem J.R. Bossers<sup>a</sup> Lucas H.V. van der Woude<sup>a, b</sup> Froukje Boersma<sup>c</sup>  
Erik J.A. Scherder<sup>a, d</sup> Marieke J.G. van Heuvelen<sup>a</sup>

PHYS THER. 2013; 93:69-78.

## Reliability of Six Physical Performance Tests in Older People With Dementia

Christiaan G. Blankevoort, Marieke J.G. van Heuvelen, Erik J.A. Scherder

# Testen

Review Article

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- Review van RCT's<sup>1</sup>
- Doel; aanbeveling testen physical fitness ouderen met dementie voor clinical trails
- 13 studies 10 exercise tests



Physical exercise test (test domain)	Studies, n	Participants, n	Intervention type (n of RCTs)	Mean age <sup>a</sup> ± SD years	Gender % ♀	Dementia type (%)	Mean baseline <sup>a</sup> ± SD	ES <sup>a</sup>	PEDro
Timed Up and Go Test (mobility) [45, 150, 151]	3	179	Exercise (3)	81.9 ± 7.3	71	AD (100)	17.1 ± 7.5	small	E (0), G (2), Mo (1), P (0)
Six Minute Walk Distance (endurance capacity) [45, 77]	2	105	Exercise (2)	77.6 ± 6.6	65	AD (39), VaD (16), LB (16), n.r. (29)	221.0 ± 82.6	medium	E (0), G (2), Mo (0), P (0)
Functional Reach Test (flexibility) [77, 150]	2	94	Exercise (2)	76.6 ± 6.6	52	AD (82), VaD (18)	20.4 ± 8.1	small	E (0), G (2), Mo (0), P (0)
Six Meter Walk (mobility) [151]	1	134	Exercise (1)	83.0 ± 7.4	75	AD (100)	0.4 ± 0.2	medium	E (0), G (1), Mo (0), P (0)
Abnormal One-Leg Balance (balance) [151]	1	134	Exercise (1)	83.0 ± 7.4	75	AD (100)	–	–	E (0), G (1), Mo (0), P (0)
Tinetti Balance Scale (balance) [56]	1	116	Pharmaceutical (1)	73.4 ± 2.5	62	AD (100)	8.5 ± 1.2	large	E (1), G (0), Mo (0), P (0)
Five Times Sit to Stand (leg strength) [150]	1	29	Exercise (1)	76.9 ± 6.7	51	AD (72), LB (28)	18.9 ± 7.2	small	E (0), G (1), Mo (0), P (0)
Berg Balance Scale (balance) [77]	1	85	Exercise (1)	76.6 ± 6.5	52	AD (61), VaD (20), LB (19)	47.5 ± 16.9	small	E (0), G (1), Mo (0), P (0)
30 Second Chair Stand (leg strength) [152]	1	16	Exercise (1)	74.5 ± –	37	AD (100)	–	–	E (0), G (0), Mo (1), P (0)
Two Minute Step Test (endurance capacity) [152]	1	16	Exercise (1)	74.5 ± –	37	AD (100)	–	–	E (0), G (0), Mo (1), P (0)

E = Excellent (9–10); G = good (6–8); Mo = moderate (4–5); P = poor (0–3); LB = Lewy body disease; n.r. = not reported. <sup>a</sup> Weighted data as a function of the number of participants.

# Conclusie (1)

- Grote heterogene groep
- Onvoldoende info over psychometrische eigenschappen
- Meer onderzoek nodig
- 6 aanbevolen testen

1. Bossers et al. Dement Geriatr Cogn Disord Extra 2012;2:589–609





# “best” beschikbare testen

	Endurance capacity	Muscle strength*	Balance	Mobility
1	Six Minute Walk Distance <sup>*, a-c</sup>	Five Times Sit to Stand <sup>*</sup>	Tinetti Balance Scale <sup>*, a, b</sup>	Timed Up and Go <sup>*, b, c</sup>
2		30 Second Chair Stand <sup>*</sup>		Six Meter Walk <sup>*, a-c</sup>

<sup>a</sup> Able to measure an effect (sensitivity to change). <sup>b</sup> Test was used in excellent/good-quality RCTs (PEDro). <sup>c</sup> Reliable/valid in dementia patients. \* More research is needed to recommend these tests.



# Testen

## Reliability of Six Physical Performance Tests in Older People With Dementia

Christiaan G. Blankevoort, Marieke J.G. van Heuvelen, Erik J.A. Scherder

- Prospectief, niet experimenteel onderzoek<sup>2</sup>
- 58 ouderen (70-92) lichte tot meer ernstige dementie (MMSE 10-19/ 20-28)
- Doel: betrouwbaarheid (reliability/agreement)

6 physical performance tests

Baseline and Retest Outcomes (and Standard Deviations) and Reliability Values for the 6 Physical Performance Tests Stratified by Current Cognitive Functioning<sup>a</sup>

Variable	Measure	6-m Walk Test (m/s)	F8W (s)	TUG (s)	FICSIT-4	Chair Rise Test (n)	Jamar Dynamometer (kg)
Mild cognitive impairment (MMSE=20-28)	n	30	25	30	30	29	29
	Session 1, $\bar{X}$ (SD)	0.74 (0.26)	48.12 (25.21)	16.95 (7.49)	2.72 (1.14)	9.12 (3.11) <sup>b</sup>	20.83 (7.87)
	Session 2, $\bar{X}$ (SD)	0.73 (0.30)	45.61 (24.93)	17.01 (6.96)	2.83 (1.29)	9.33 (3.56) <sup>c</sup>	20.97 (6.84)
	ICC (CI <sub>95</sub> )	.83 (.67-.91)	.94 (.86-.97)	.96 (.92-.98)	.82 (.65-.91)	.79 (.60-.90)	.86 (.72-.93)
	SEM (CI <sub>95</sub> )	0.11 (0.09-0.11)	6.24 (5.63-10.03)	1.43 (1.06-1.79)	0.59 (0.48-0.81)	1.52 (1.22-2.08)	2.75 (1.85-3.15)
	MDC <sub>95</sub>	0.29	17.30	3.96	1.64	4.21	7.62
Moderate cognitive impairment (MMSE=10-19)	n	28	21	28	28	23	28
	Session 1, $\bar{X}$ (SD)	0.80 (0.25)	43.42 (15.41)	20.26 (11.59)	2.38 (1.04)	6.85 (2.21) <sup>b</sup>	20.71 (10.52)
	Session 2, $\bar{X}$ (SD)	0.78 (0.26)	45.51 (15.39)	20.46 (10.63)	2.30 (1.31)	7.00 (2.49) <sup>c</sup>	20.13 (9.77)
	ICC (CI <sub>95</sub> )	0.89 (0.78-0.95)	0.85 (0.67-0.94)	0.94 (0.87-0.97)	0.80 (0.61-0.90)	0.88 (0.73-0.95)	0.94 (0.87-0.97)
	SEM (CI <sub>95</sub> )	0.09 (0.07-0.13)	6.00 (4.01-7.58)	2.91 (2.10-3.61)	0.60 (0.48-0.82)	0.83 (0.65-1.04)	2.57 (2.02-3.47)
	MDC <sub>95</sub>	0.25	16.63	8.07	1.66	2.30	7.11

<sup>a</sup> F8W=Figure-of-Eight Walk Test, TUG=Timed "Up-and-Go" Test, FICSIT-4=Frailty and Injuries: Cooperative Studies of Intervention Techniques-4, CI<sub>95</sub>=95% confidence interval.

<sup>b</sup> Significant difference at baseline between participants with higher and lower scores on the MMSE ( $P<.01$ ).

<sup>c</sup> Significant difference at retest between participants with higher and lower scores on the MMSE ( $P<.01$ ).

# Conclusie (2)

- Betrouwbaarheid alle testen goed
- Geschikt voor cross-sectioneel of interventie onderzoek (groepen)
- Ouderen met milde tot meer ernstige dementie
- Onduidelijk individuele evaluatie (grote MDC)

2. Blankevoort et al. Reliability of Six Physical Performance Tests in Older People With Dementia. *PHYS THER.* 2013; 93:69-78.



Minimal Detectable Change te groot, dan:

- Verandering in prestatie moet dan heel groot zijn
- Kleine, klinisch relevante veranderingen worden niet gemeten



# Wat vindt u?

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**Conclusions.** The physical performance tests evaluated are useful for detecting differences in performance between older people with mild to moderate dementia and, therefore, are suitable for cross-sectional or controlled intervention studies. They appear less suitable to monitor clinically relevant intra-individual performance changes. Future studies should focus on the development of more sensitive tests and the identification of criteria for clinically relevant changes in this rapidly growing population.





# Resumé

De volgende testen kunnen worden “aanbevolen”;

- Valide en betrouwbaar
- Bij ouderen met dementie
- Enkele test onduidelijk over meten individuele verandering



# 6 Minuten Wandel Test (1)

- Uithoudingsvermogen (en functionele mobiliteit)
- 6 minuten comfortabel zelfst. Lopen
- Een keer oefenen
- Loophulpmiddel is toegestaan
- Parcours bijvoorkeur 30 m.
- Meten van afstand en ervaren vermoeidheid met Borgscore



ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories.  
ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002  
Jul1;166(1):111-7

# 6 Minuten Wandel Test

- Betrouwbaarheid: ICC=.982-.987 (P<.001)
- MDC<sup>90</sup>: 33.47 m<sup>(3)</sup>
- Normwaarden zie; Rikli RE. et al. Senior Fitness test Manual, Human Kinetics, 2001 (thuis wonende ! ouderen (60-94))

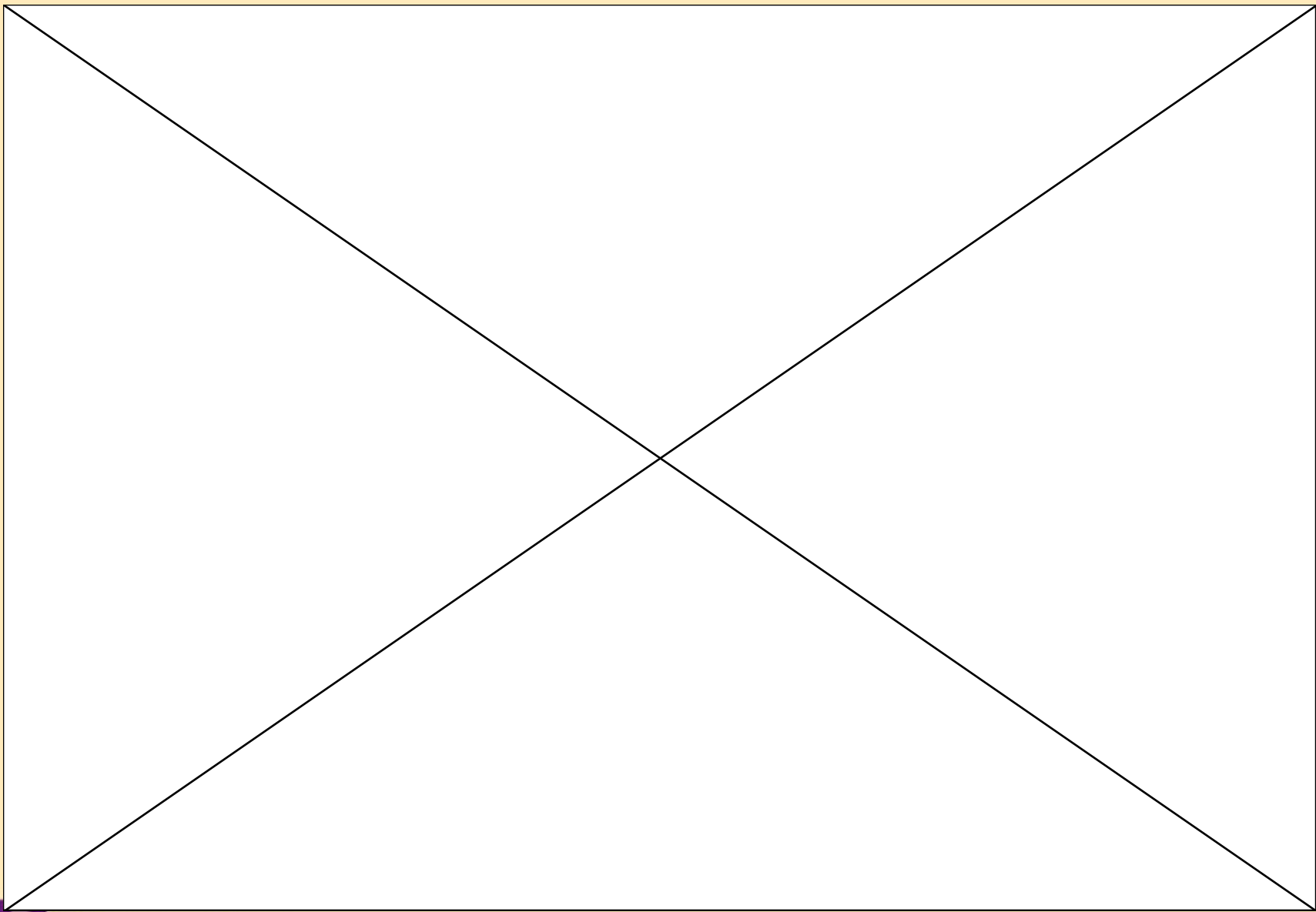
3. Ries JD, Echternach JL, Nof L, Gagnon, Blodgett M. Test-retest reliability and minimal detectable change scores for the timed “up & go” test, the six-minute walk test, and gait speed in people with Alzheimer disease. *Phys Ther* 2009;89:569–579

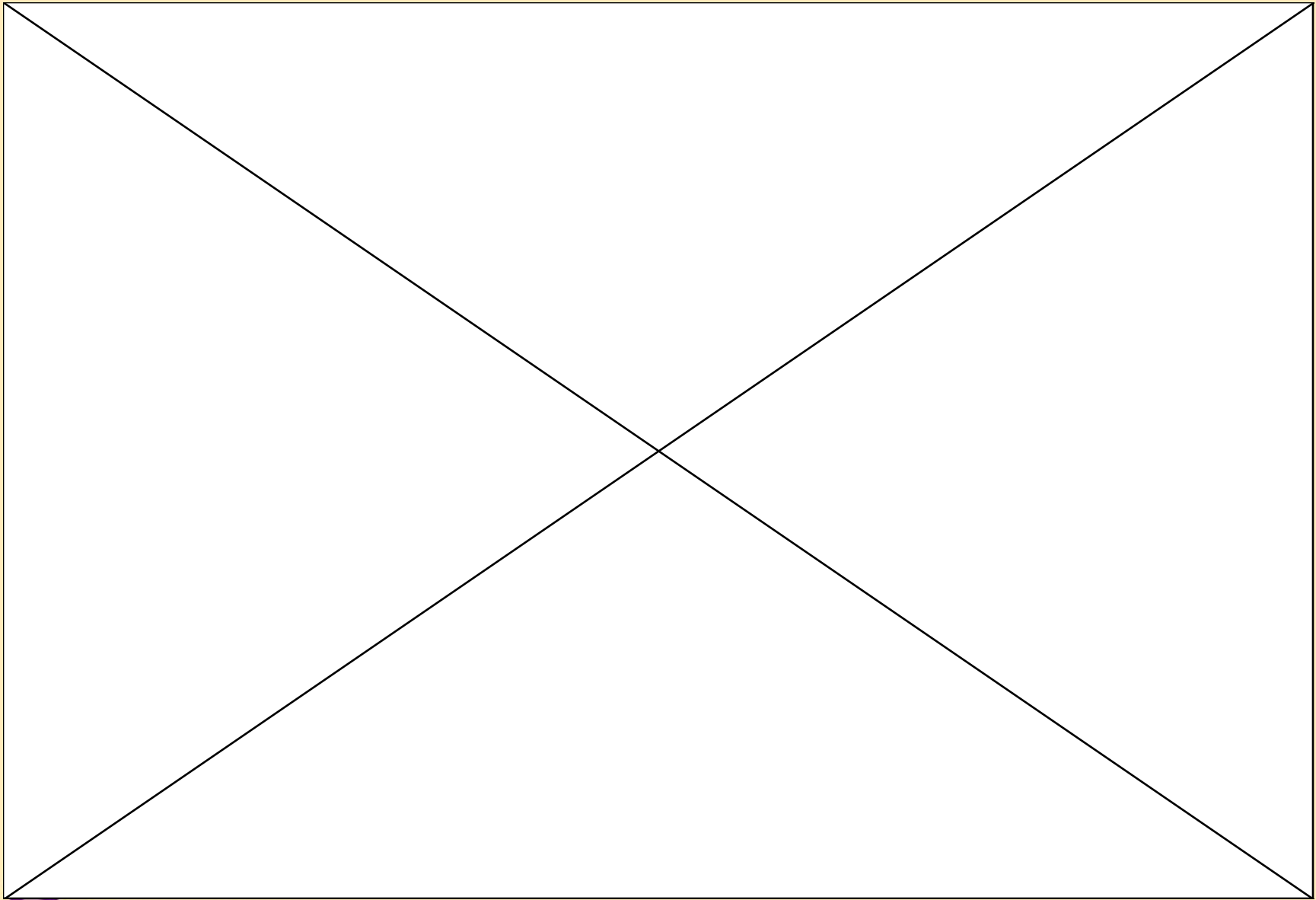


# Timed Up & Go (1,2)

- Functionele mobiliteit
- Op staan uit stoel, 3 m. lopen, omdraaien, terug lopen, gaan zitten
- Lopen zo “snel” en veilig ! als kan
- Handen en loophulp zijn toegestaan
- Gem. tijd in sec. van 2 testen







- Betrouwbaarheid: ICC=.92-.97<sup>(2)</sup>  
ICC=.985-.988 (P<.001)<sup>(3)</sup>
- MDC<sup>90</sup>: 4.09 sec<sup>(3)</sup>
- MDC<sup>95</sup> (mild dem.):3.96 sec<sup>(2)</sup>
- MDC<sup>95</sup> (moderate dem.):8.07 sec.<sup>(2)</sup>

2. Blankevoort et al. Reliability of Six Physical Performance Tests in Older People With Dementia. *PHYS THER.* 2013; 93:69-78.

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- Onduidelijk voor val screening<sup>(4)</sup>
- Normwaarden; 12 sec. thuis wonende ouderen (65-85)<sup>(5)</sup>



4.Schoene D, Wu SM, Mikolaizak AS, Menant JC, Smith ST, Delbaere K, Lord SR. Discriminative ability and predictive validity of the timed up and go test in identifying older people who fall: systematic review and meta-analysis. *Journal of the American Geriatrics Society* 2013; 61(2): 202-208

5.Bischoff et al. Identifying a cut-off point for normal mobility: a comparison of the timed up and go' test in community-dwelling and institutionalised elderly women. *Age and Ageing* 2003; 32: 315–Age and Ageing 2003; 32: 315–320



# Tinetti (1)

- Balans
- Geen psychom. eigenschappen bekend ouderen met dementie
- (ICC= .96, ouderen met dementie (N=39) <sup>(6)</sup> )
- (MDC; 5.0, ouderen in verpleeg-verzorgingshuis <sup>(7)</sup> )
- Normwaarde; <26 duidt op probleem  
    <19 verhoogd valrisico, ouderen<sup>(8)</sup>



6. Van Iersel, M., Benraad, C. M., & Olderikkert, M. M. (2007). Validity and reliability of quantitative gait analysis in geriatric patients with and without dementia. *Journal of the American Geriatrics Society*, 55(4), 632-633.

7. Faber, M. J., Bosscher, R. J., & van Wieringen, P. C. (2006). Clinimetric properties of the performance-oriented mobility assessment. *Phys Ther*, 86(7), 944-954.

8. <http://www.meetinstrumentenzorg.nl/AlgemeneMeetinstrumenten.aspx>

BALANS	Score: /16	
Instructies	De persoon is gezeten op een harde stoel zonder leuning, de volgende manoeuvres worden getest.	
1. Zitbalans	-zakt scheef of onderuit	0
	-zit stabiel en veilig	1
2. Rechtopstaan	-onmogelijk zonder hulp	0
	-mogelijk met armsteun	1
	-mogelijk zonder armsteun	2
3. Pogingen tot rechtopstaan	-onmogelijk zonder hulp	0
	-mogelijk >1 poging	1
	-mogelijk met 1 poging	2
4. Balans in stand (eerste 5")	-onstabiel (wankelt, voet-en rompbewegingen)	0
	-stabiel met steun (rollator, stok of dergelijke)	1
	-stabiel zonder enige steun	2
5. Balans in stand	-onstabiel	0
	-stabiel, voetafstand >10 cm of armsteun	1
	-voeten gesloten, zonder steun	2
6. Duwtje op sternum (3x)(voeten samen)	-begint te wankelen	0
	-wankelt maar herstelt zich	1
	-stabiel	2
7. Gesloten ogen (voeten samen)	-onstabiel	0
	-stabiel	1
8. 360°ronddraaien	-onregelmatige stapjes	0
	-regelmatige stapjes	1
	-onstabiel (wankelt)	0
	-stabiel	1
9. Gaan zitten	-onveilig (valt, misrekening afstand)	0
	-gebruikt armen	1
	-veilige en vloeiende beweging	2

<b>GANG</b>	<b>Score:/12</b>	
Instructies	De persoon staat samen met de onderzoeker; hij stapt in de gang of in de kamer, eerst aan een gewoon tempo, dan op de terugweg in een snellere maar veilige pas (hij gebruikt eigen hulpmiddelen zoals een stok of een looprek.	
10. Inzetten van gang na startwoord	-aarzeling of verschillende pogingen	0
	-zonder aarzeling	1
11. Paslengte en hoogte		
Re zwaaivoet	-passeert de li standvoet niet	0
	-passeert de li standvoet	1
	-komt niet los van de grond	0
	-komt los van de grond	1
Li zwaaivoet	-passeert de re standvoet niet	0
	-passeert de re standvoet	1
	-komt niet los van de grond	0
	-komt los van de grond	1
12. Pas symmetrie	-re en li staplengte zijn niet gelijk	0
	-re en li staplengte zijn gelijk	1
13. Pas continuïteit	-haltes of discontinuïteit tussen passen	0
	-passen lijken continu	1
14. Afwijkende gang	-opvallende afwijking	0
	-middelmatige afwijking of gebruik van loophulp	1
	-rechtuit zonder loophulp	2
15. Romp	-uitgesproken rompbeweging of gebruik van loophulp	0
	-geen rompbeweging maar flexie van knieën, rug of spreiding van armen	1
	-rechttop zonder loophulp	2
16. Voetafstand	-hielen uit elkaar	0
	-hielen raken mekaar bijna tijdens stappen	1

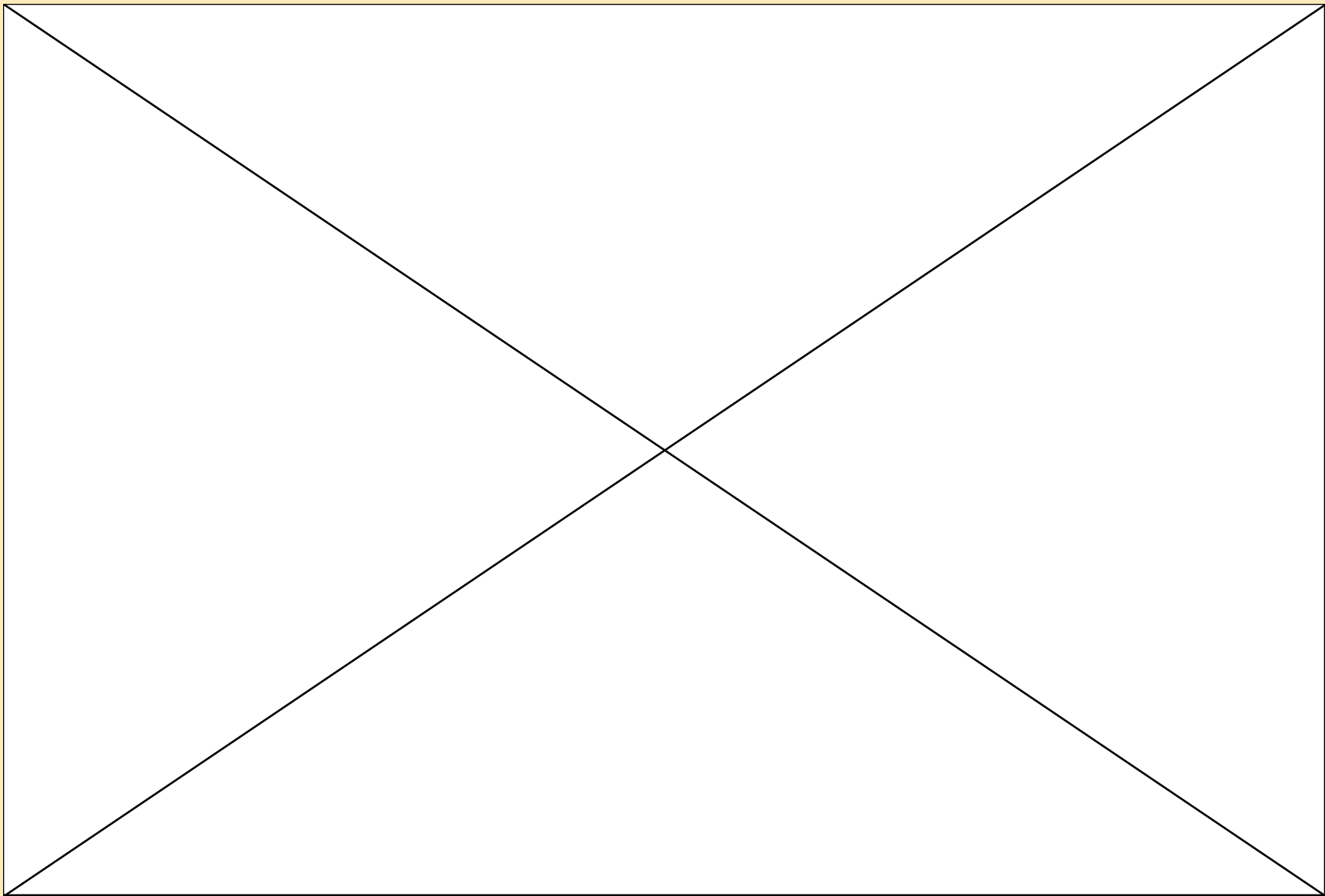
- Tinetti filmpje



# 30 sec. Sit-to-stand Test of Chair-stand Test <sup>(1,2)</sup>

- Spierkracht onderste extremiteiten
- Gaan staan vanuit stoel, rechtop staan en weer zitten
- Zo vaak als kan in 30 sec.
- Tel het aantal x rechtop staan
- Evt. aangepast met armsteun <sup>(2)</sup>





- Betrouwbaarheid:  $ICC = .84 (CI^{95} = .73 - .90)$
- $MDC^{95}$ : 3.49 keer<sup>(2)</sup>
- Normwaarden zie; Rikli RE. et al. Senior Fitness test Manual, Human Kinetics, 2001 (thuis wonende ! ouderen (60-94))

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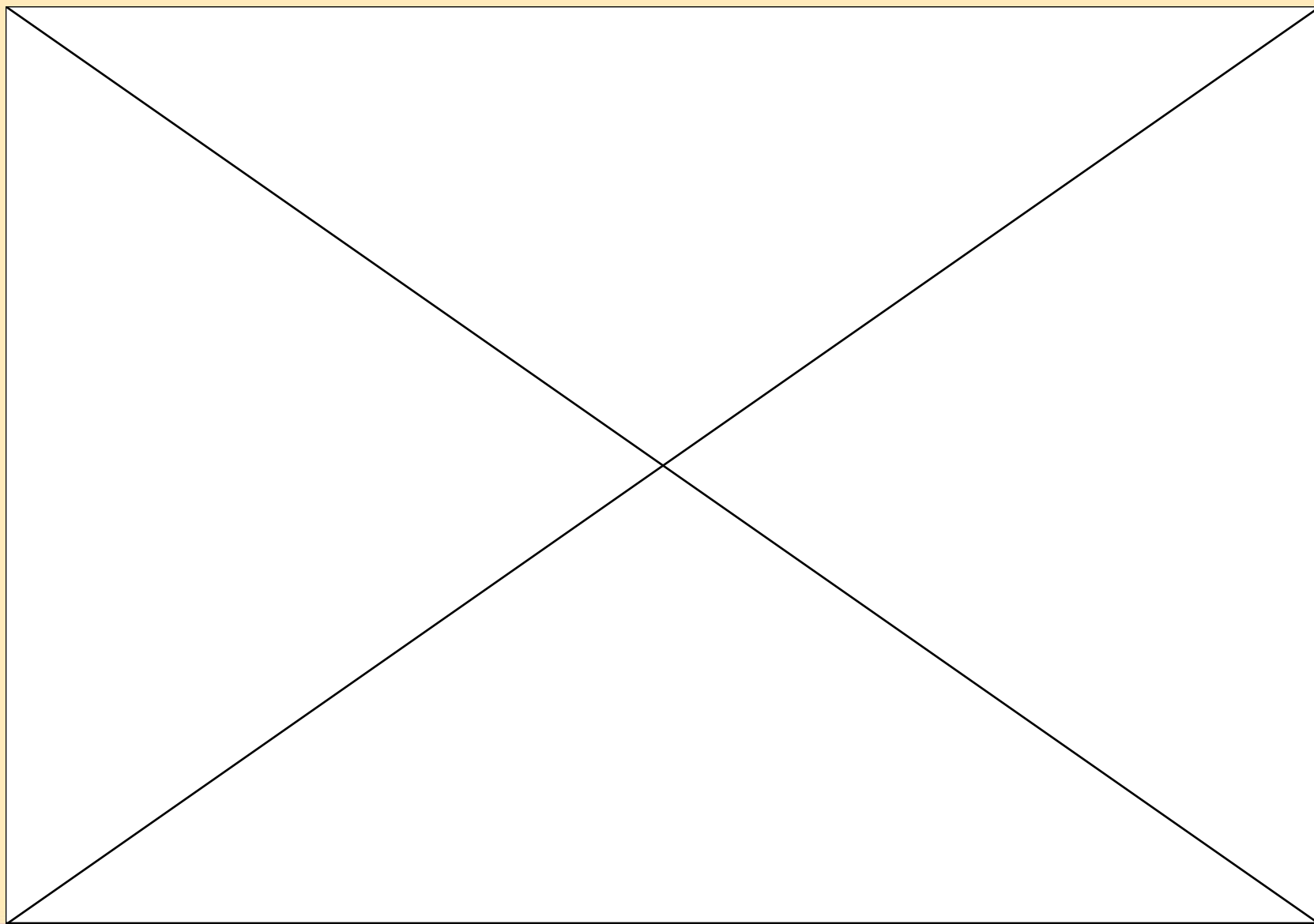


# Five Times Sit-to-Stand (1)

- Spierkracht onderste extremiteiten
- 5 x opstaan vanuit stoel, armen gekruisd
- Tijd stopt bij 5 de keer rechtop staan







- **PM eigenschappen niet bekend bij ouderen met dementie.**
- (ICC= .957, thuis wonende ouderen <sup>(9)</sup>)
- (MDC: 4.2 sec., gezonde ouderen <sup>(10)</sup>)
- (> 12-15 sec. verminderde kracht, thuis wonende ouderen <sup>(11)</sup>)
- (> 15 valrisico, thuis wonende ouderen <sup>(12)</sup>)

9. Bohannon, R. W. (2006). "Reference values for the five-repetition sit-to-stand test: a descriptive meta-analysis of data from elders." *Perceptual and Motor Skills* 103(1): 215-222.

10. Schaubert, K. L. and Bohannon, R. W. (2005). "Reliability and validity of three strength measures obtained from community-dwelling elderly persons." *J Strength Cond Res* 19(3): 717-720.

11. Tiedemann, A., Shimada, H., et al. (2008). "The comparative ability of eight functional mobility tests for predicting falls in community-dwelling older people." *Age and Ageing* 37(4): 430-435

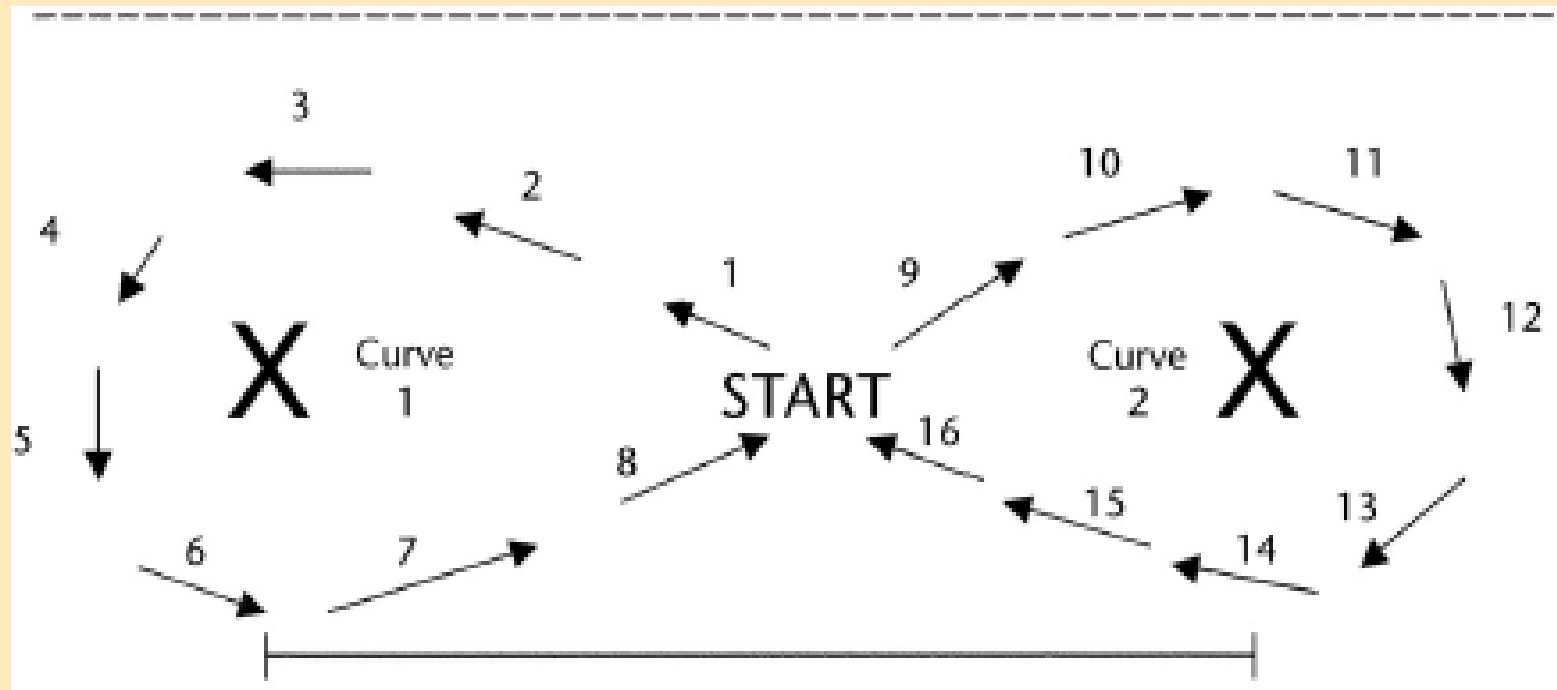
12. Buatois, S., Miljkovic, D., et al. (2008). "Five times sit to stand test is a predictor of recurrent falls in healthy community-living subjects aged 65 and older." *Journal of the American Geriatrics Society* 56(8): 1575-1577



# Figure-of-eight walk test (2)

- Balans
- 2 rondjes lopen van 10 m. in 8 vorm (1,5 M. afstand)
- Lopen zo “snel” en veilig ! als kan
- 2 x testen, de snelste noteren





# F8W

- Betrouwbaarheid: ICC=.91 (CI<sup>95</sup>=.85-.95)
- MDC<sup>95</sup>: 17.35 sec.<sup>(2)</sup>



2. Blankevoort et al. Reliability of Six Physical Performance Tests in Older People With Dementia. PHYS THER. 2013; 93:69-78.

# FICSIT-4 (2)

(Frailty and Injuries: Cooperative Studies of Intervention Techniques- 4), lijkt op Four-Test Balance Scale

## Tests of Static Balance:

### Posities van de voeten in de Four-Test Balance Scale

1. VOETEN TEGEN ELKAAR STAND

10 sec



2. SEMI-TANDEM STAND

10 sec



3. TANDEM STAND

10 sec



4. OP 1 BEEN STAAN

30 sec



- Verschillende versies !
- Ogen open en ogen dicht
- Geen hulpmiddel
- Positie opbouwend
- Blote voeten
- Niet oefenen van te voren



## Instructions:

Demonstrate each position to the subject, then ask them to perform and time.

## Timing is stopped if:

- the person displaces their stance foot
- the suspended foot touches the ground
- observer offers support to avoid fall
- the suspended foot touches the other calf for support (cue the person to avoid this)





**F-1. FEET CLOSELY TOGETHER, UNSUPPORTED, eyes open (ROMBERG POSITION)**

INSTRUCTIONS: Stand still with your feet together as demonstrated for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to stand 3 seconds but stays steady
- 0 needs help to keep from falling

If subject is able to do this, proceed to the next position, if not, stop.

**F-2. FEET CLOSELY TOGETHER, UNSUPPORTED, eyes closed (ROMBERG POSITION)**

INSTRUCTIONS: Please close your eyes and stand still with your feet together as demonstrated for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to keep eyes closed 3 seconds but stays steady
- 0 needs help to keep from falling

If subject is able to do this, proceed to the next position, if not, stop.

**F-3. SEMI-TANDEM: eyes open HEEL OF 1 FOOT PLACED TO THE SIDE OF THE 1<sup>ST</sup> TOE OF THE OPPOSITE FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD)**

INSTRUCTIONS: Please stand still with your feet together as demonstrated for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to stand 3 seconds but stays steady
- 0 needs help to keep from falling

If subject is able to do this, proceed to the next position, if not, stop.

**F-4. SEMI-TANDEM: eyes closed HEEL OF 1 FOOT PLACED TO THE SIDE OF THE 1<sup>ST</sup> TOE OF THE OPPOSITE FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD)**

INSTRUCTIONS: Please close your eyes and stand still with your feet together as demonstrated for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to keep eyes closed 3 seconds but stays steady
- 0 needs help to keep from falling

If subject is able to do this, proceed to the next position, if not, stop.

**F-5. FULL TANDEM: eyes open HEEL OF 1 FOOT DIRECTLY IN FRONT OF THE OTHER FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD)**

INSTRUCTIONS: Please stand still with your feet together as demonstrated for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to stand 3 seconds but stays steady
- 0 needs help to keep from falling

If subject is able to do this, proceed to the next position, if not, stop.

**F-6. FULL TANDEM: eyes closed HEEL OF 1 FOOT DIRECTLY IN FRONT OF THE OTHER FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD)**

INSTRUCTIONS: Please stand still with your feet together as demonstrated for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to stand 3 seconds but stays steady
- 0 needs help to keep from falling

If subject is able to do this, proceed to the next position, if not, stop

**F-7. STANDING ON ONE LEG: eyes open**

INSTRUCTIONS: Stand on one leg as long as you can without holding.

- 4 able to lift leg independently and hold >10 seconds
- 3 able to lift leg independently and hold 5-10 seconds
- 2 able to lift leg independently and hold = or >3 seconds
- 1 tries to lift leg unable to hold 3 seconds but remains standing independently
- 0 unable to try or needs assist to prevent fall

Total FICSIT-4 Static Balance score = \_\_\_\_\_ / 28

# Aangepast in artikel Blankevoort et al.

- Alleen ogen open
- 0 for unsuccessful
- 1 for successful parallel stance
- 2 for semi-tandem stance
- 3 if tandem stance was maintained less than 10 seconds
- 4 for tandem stance
- 5 for single legged stance

If a participant maintained the parallel or semi-tandem stance less than 10 seconds but more than 3 seconds, an additional 0.5 point was awarded. Higher scores thus indicate better performance.



- Four test balance scale/ FICSIT-4 filmpje



- Betrouwbaarheid: ICC= .79 (CI<sup>95</sup>=.67-.87) <sup>(2)</sup>  
R= .66 <sup>(21)</sup>
- MDC<sup>95</sup>: 1,5 points <sup>(2)</sup>

21. JE Rossiter-Fornoff et al. A cross-sectional validation study of the FICSIT common data base static balance measures. Frailty and Injuries: Cooperative Studies of Intervention Techniques. Journals of Gerontology Series A: Biological Sciences and Medical Sciences, Vol 50, Issue 6, 1995



# Jamar dynamometer (2)

- Handknijpkracht
- Staand in voorkeurs hand
- Arm langs het lichaam, handpalm richting been
- Zo hard knijpen als mogelijk, de hoogste score telt



- Betrouwbaarheid;  $=.90$  ( $CI^{95}=.84-.94$ )
- $MDC^{95}$ : 7.59 kg.<sup>(2)</sup>
- Indicator perifere spierkracht, fysiek frail <sup>(13)</sup>

♀  $\leq 18$  kg

♂  $\leq 30$  kg



13. Fried LP et al. Frailty in older adults; evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56:M146-M156

# Lopen en cognitive decline

- Verminderde loopfunctie meer dan normale veroudering
- Verandering snelheid, ritme, paslengte, gangspoor
- Indicator voor cognitieve achteruitgang, (vnl. planning, proces verwerking)



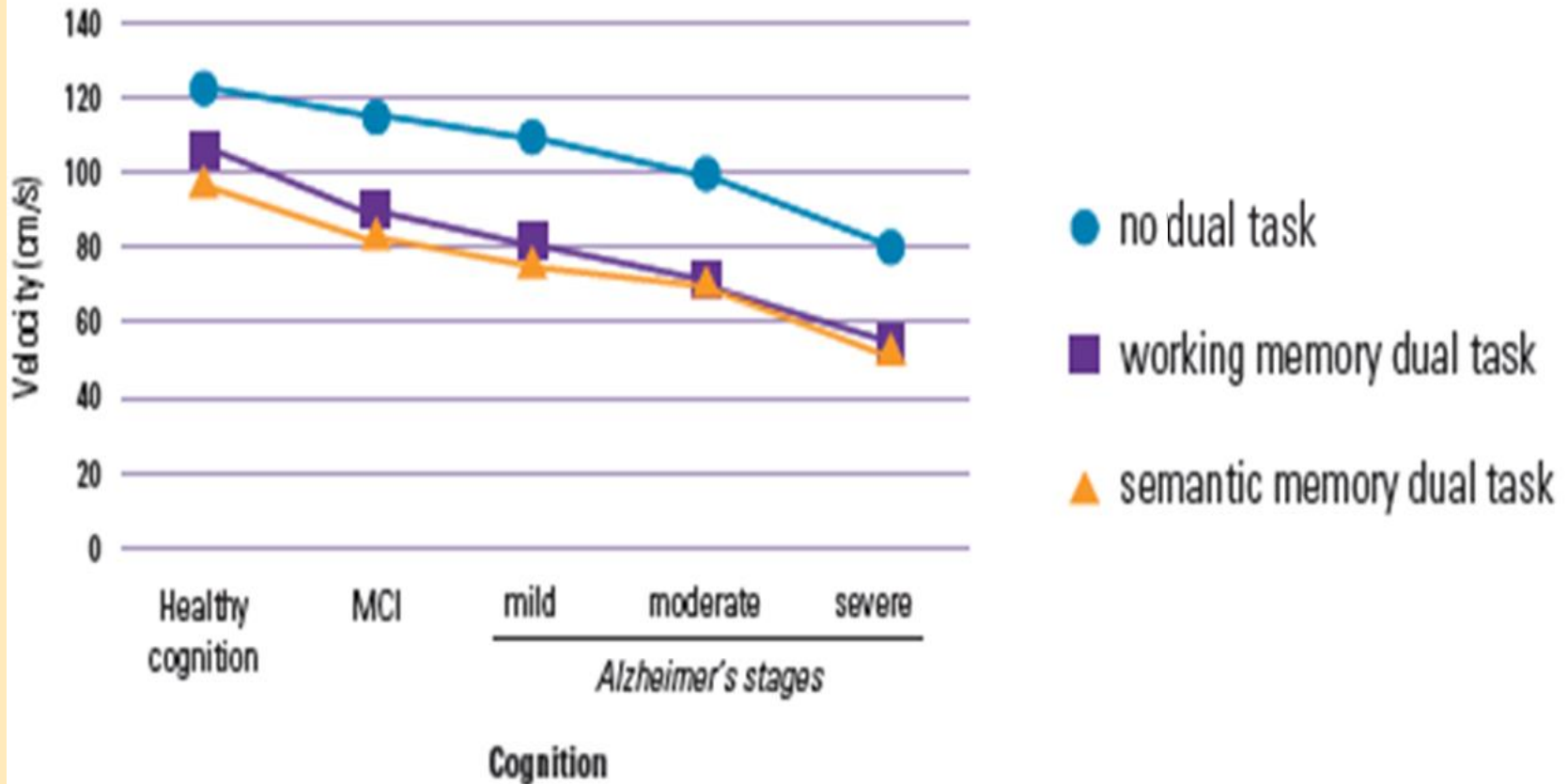
18. Mielke M, Savica R, Drubach D, et al. Slow gait predicts cognitive decline: A population-based cohort study. *Alzheimer's & Dementia*. 2012;8(4):P318.

19. Bridenbaugh S, Monsch AU, Kressig RW. How does gait change as cognitive decline progresses in the elderly? *Alzheimer's & Dementia*. 2012;8(4):P131–P132.

20. Ikram et al. Cognition and gait reveal distinct patterns of association in an aging population. *Alzheimer's and Dementia*, Volume 8 (4) Elsevier – Jul 1, 2012



## Gait speed



19. Bridenbaugh S, Monsch AU, Kressig RW. How does gait change as cognitive decline progresses in the elderly? *Alzheimer's & Dementia*. 2012;8(4):P131–P132.

- Verandering in lopen geeft wellicht vroege informatie over beginnende dementie
- Eerder screenen
- Beweginginterventies ter voorkoming dementie ?



# Loopsnelheid

- Sixth vital sign
- Indicator negatieve gezondheidsuitkomsten (oa vallen) <sup>(14,15)</sup>
- Gebruiken als outcome instrument
- Eenvoudig instrument



14. Peel et al. Gait Speed as a measure in Geriatric Assessment in Clinical Settings : A Systematic review. *Journals of Gerontology Series A: Biological Sciences & Medical* ;Jan2013, Vol. 68 Issue 1, p39

15. Studenski S, et al. Physical performance measures in the clinical setting. *J Am Geriatr Soc.* 2003;51(3):314–322.

- Comfortable loopsnelheid
- Veel gebruikt zijn 4 MWT en 6 MWT
- Beide even betrouwbaar bij patienten met cognitieve problemen <sup>(16)</sup>
- Lopen in rechte lijn
- 2 maal, de snelste telt



16. Munoz-Mendoza et al. Reliability of 4-m and 6-m walking speed tests in elderly people with cognitive impairment. Archives of Gerontology and Geriatrics 52 (2011)



- Betrouwbaarheid:  $ICC^{6MWT} = .86$  (2,16)  
 $ICC^{4MWT} = .91$  (16)
- $MDC^{6MWT} : 0.27$  m/s (2)
- $MCID^{6MWT} : 0,21$  m/s (17)
- Iedere verandering van 0.1 m/s heeft invloed op gezondheidsuitkomst (18)



2. Blankevoort et al. Reliability of Six Physical Performance Tests in Older People With Dementia. *PHYS THER.* 2013; 93:69-78.

16. Munoz-Mendoza et al. Reliability of 4-m and 6-m walking speed tests in elderly people with cognitive impairment. *Archives of Gerontology and Geriatrics* 52 (2011)

17. Iersel van et al. Systematic review of quantitative clinical gait analysis in patients with dementia. *Z.Gerontol Geriatr.* 2004 Feb;37(1):27-32

18. Graham JE et al. Assessing Walking Speed in Clinical research. A Systematic review. *J Eval Clin Pract* 2008;14(4):552-562

- Normwaarden 0.6 – 1.0 <sup>(15)</sup>
- Afkappunten <sup>(14)</sup> ;  
< 0.8 m/s neg. gez.uitkomsten  
< 0.6 m/s toename functionele achteruitgang



14. Peel et al. Gait Speed as a measure in Geriatric Assesment in Clinical Settings : A Systematic review. *Journals of Gerontology Series A: Biological Sciences & Medical*;Jan2013,Vol.68 Issue1,p39
15. Studenski S, et al. Physical performance measures in the clinical setting. *J Am Geriatr Soc.* 2003;51(3):314–322.

# GMWT

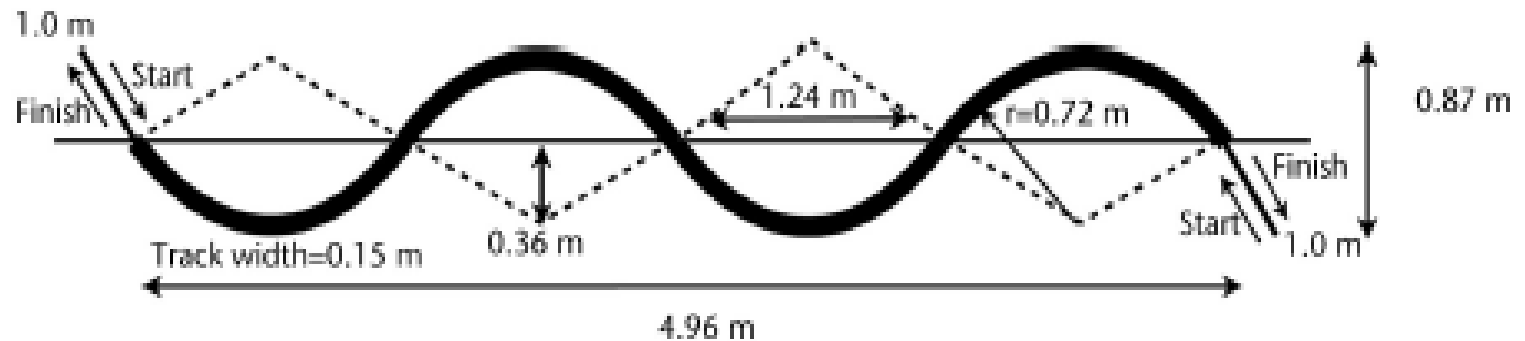
## The Groningen Meander Walking Test: A Dynamic Walking Test for Older Adults With Dementia

Willem J.R. Bossers, Lucas H.V. van der Woude, Froukje Boersma, Erik J.A. Scherder, Marieke J.G. van Heuvelen

*PHYS THER.* 2014; 94:262-272.

- dynamic walking ability (keeping balance during walking)
- walking over a meandering curved line
- emphasis on walking speed and stepping accuracy, while changing direction
- N=42 (mild n=12, moderate n=28, severe dementia n=2)
- Age =  $86.7 \pm 5.2$  (75–99)





- 6 m track
- 4 bends
- drawn on a smooth, dark blue mat
- width of the meandering track 0.15 m.
- 1 m start and finish run out
- forth and then back.



- walk as fast and accurately as possible
- measure the time and count the number of times stepping outside the lines (overstep) (mean F and B)
- walking device is allowed
- faster time score indicated better performance
- fewer number of oversteps indicated better performance.



- Betrouwbaarheid: ICC = .942

$$\text{ICC}^{(4\text{WW})} = .837$$

$$\text{ICC}^{(\text{overstep})} = .630$$

- MDC : 2.96 sec.
- MDC<sup>(4WW)</sup> : 10.35 sec
- MDC<sup>(overstep)</sup> : 4.38



**Conclusions.** The GMWT is a feasible test for people with dementia. With the GMWT time score, a reliable and sensitive field test to measure walking abilities in older adults with dementia is available. The GMWT overstep score can be used to give information about the execution according to protocol and should be emphasized during the instructions. Future studies need to investigate the validity of the GMWT.



# Casus 1

- Dhr. Veenstra, 84 jaar, dementie (Alzheimer + vasculair) (GDS 5 of verdwaalde “ik”, moderate dem.), woont in verpleeghuis.
- Co-morb. THA re. 15 jaar gelden, DM2
- Loopt met rollator (FAC=4), flexie heupen en knieën.
- Vraag; risico factoren vallen

MEETINSTRUMENT(EN) ?



# Casus 2

- Mw. de Boer 93 jaar, dementie (Vasculair) (GDS 6 of verborgen“ik”, severe dem.), woont in verpleeghuis.
- Co-morb. gonatrosis bdz , osteoporose, afasie
- Loopt met rollator (FAC=3), alg. flexiehouding, varusstand knieën.
- Vraag; volgens VP gaat lopen steeds slechter

MEETINSTRUMENT(EN) ?



# Casus 3

- Trainen en na 4 weken herhaalt u de volgende metingen
- TUG; 1.24            TUG; 1.20

Wat vind u?



- Trainen en na 4 weken herhaald u de volgende metingen
- TUG; 1.24      TUG; 1.20

MDC (mild dem.)=3.96 sec

MDC (moderate dem.)=8.07 sec





- TUG; 1.24                      TUG; 1.14
- 30 s SST; 10                    30 s SST; 12
  
- Wat vind u?



- TUG; 1.24                      TUG; 1.14
- 30 s SST; 10                      30 s SST; 12

30 s SST: MDC= 3.49 keer

TUG: MDC (mild dem.)=3.96 sec

MDC (moderate dem.)=8.07 sec



- TUG; 1.24
  - 30 s SST; 10
  - 6mLT; 12 sec. (0,3 m/s)
- TUG; 1.14
  - 30 s SST; 12
  - 6mLT; 10 sec. (0,6 m/s)

6MWT: MCID= 0,21 m/s

30 s SST: MDC= 3.49 keer

TUG: MDC (mild dem.)=3.96 sec

MDC (moderate dem.)= 8.07 sec



# Nog eentje dan

- Tinetti; 17                      Tinetti; 23
- Ficsit-4; 2                      Ficsit-4; 3,5
- 5x SST; 18 s.                  5x SST; 13 s.
- 6MWT; 210 m                  6MWT; 235 m



# Nog eentje dan

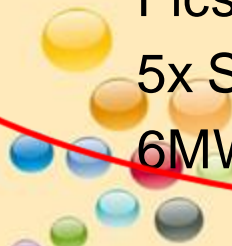
- Tinetti; 17                      Tinetti; 23
- Ficsit-4; 2                      Ficsit-4; 3,5
- 5x SST; 18 s.                  5x SST; 13 s.
- 6MWT; 210 m                  6MWT; 235 m


Tinetti; MDC= 5 (ouderen in verpleeg-verzorgingshuis)

Ficsit-4; MDC= 1,5 punten

5x SST; MDC= 4.2 sec. (gezonde ouderen)

6MWT; MDC= 33.5 m.



A black and white photograph of Albert Einstein, looking surprised or thoughtful, pointing with his right hand towards a chalkboard. The chalkboard has the text "What I Learned From..." written on it in white chalk. The image is framed by a colorful border at the top and bottom.

What I  
Learned  
From...

- Enkele test onduidelijk over meten individuele verandering
- Houd rekening met de meetfout (MCD)
- Gebruik meerdere testen !

# Bedankt voor uw aandacht



# Oefenen





- [https://www.youtube.com/watch?v=dsTfqk9ZTiw&feature=player\\_embedded](https://www.youtube.com/watch?v=dsTfqk9ZTiw&feature=player_embedded)
- [https://www.youtube.com/watch?v=daGAj0Q0XmU&feature=player\\_embedded](https://www.youtube.com/watch?v=daGAj0Q0XmU&feature=player_embedded)
- [https://www.youtube.com/watch?v=soDEx4I3fWA&feature=player\\_embedded](https://www.youtube.com/watch?v=soDEx4I3fWA&feature=player_embedded)
- [https://www.youtube.com/watch?v=ChaaRZYa fl&feature=player\\_embedded](https://www.youtube.com/watch?v=ChaaRZYa fl&feature=player_embedded)
- <http://vimeo.com/5373414>
- [https://www.youtube.com/watch?v=wR0I1ex9K8c&feature=player\\_embedded](https://www.youtube.com/watch?v=wR0I1ex9K8c&feature=player_embedded)